Depleted Uranium – Surveillance and Monitoring

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Depleted Uranium Update

- Background Information
- Uses of DU
- Handling and Control of DU
- Safety information
- Medical surveillance
- Take Home Messages

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Radioactive Commodities used in the Marine Corps

- Tritium Fire Control Devices (illuminators on weapons, tanks, systems, etc.)
- NBC Devices (Chemical agent monitors, ACADAs: Ni-63)
- **Depleted Uranium (Munitions, Shielding, and Counterweights)**
- Aviation Devices (Various Sources)
- Homeland Defense Devices (Various Sources)

What is Depleted Uranium?

- DU is a dense, slightly radioactive heavy metal used by the United States and other countries in making ammunition, armor, aircraft counterweights, and other materials

- Because of its density and penetrating power, DU is an excellent material for making armor and armor-piercing weapons.

Where is DU found?

- Uranium is part of our natural environment. DU is a byproduct of the process that converts natural uranium into enriched uranium used in commercial nuclear power plants for generating electricity and in nuclear weapons
- DU has 40% less radioactivity than natural uranium

Where is DU found? (cont'd)

- Military uses of DU include antitank ammunition, armor, and various uses as a shielding material.
- DU munitions were first used by the United States in combat in Operation Desert Shield. DU munitions were also used by NATO in the Balkans.

DU Basics?

- DU ammunition represents the best technological solution to meet user requirements and is designated for use during armed conflict.
- DU ammo is used in certain weapons systems due to its superior accuracy, range, and armor piercing capabilities
- DU ammunition is extremely safe

Hazards of DU

- Toxicological
  - Primary hazard
  - Heavy metal toxicity, internal hazard, target organ – kidney; health effect from high exposures – kidney damage or failure
  - USNRC limits are based on heavy metal toxicity not radiation
- Radiological hazard
  - Secondary hazard
  - Internally, alpha particles damage is secondary to heavy metal hazard
  - Externally: gamma rays present a small exposure rate on contact with ammunition containers and shielding

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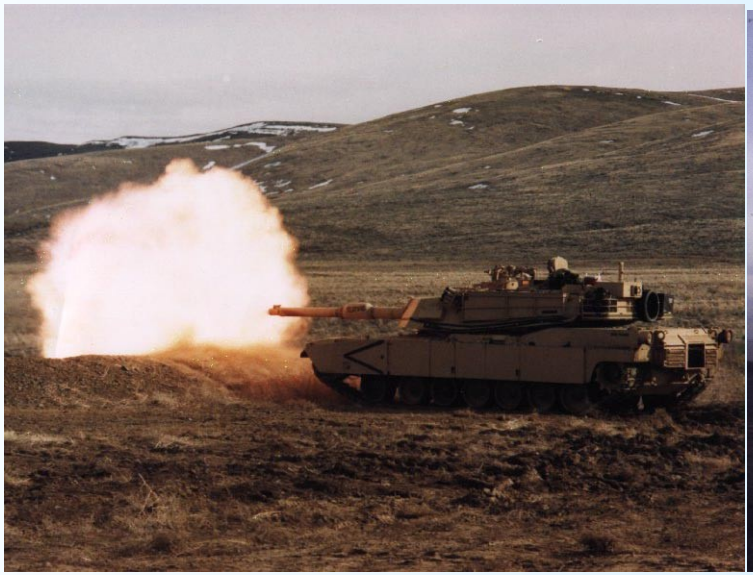
What is the Civil use of DU?

- Worldwide, DU is used in commercial and military aircraft as counterweight material.
- It is used as shielding for industrial radiography radioactive sources.
- It is also used in medical linear accelerators (to collimate or focus the beam) for treating cancer patients

USMC Depleted Uranium Usage: Munitions, Shielding and Counterweights

120mm: M1A1 Tank



25mm: AV-8 Harrier

Aircraft DU Counterweights

- Common to many civilian and military aircraft
- May weigh several ounces to 100 pounds
- Critical to maintaining stability of aircraft
- Used because of density and hardness

DU Shielding and Armor

- Shielding in radiography devices
- Shielding in linear accelerators
- Armor in the M1A1 Abrams Tank (on US Army license)
- Used for shielding because of density and hardness

Why DU Munitions?

- Penetration ability based on density and hardness of DU
- Abundance of material
- Low cost of material
- Pyrophoric (and self-sharpening during penetration) effect of DU munitions against armor

Authorized USMC Use of DU Munitions?

- Combat Use Only
  - **25 MM AV-8 Harrier Anti Tank**
  - **105 MM M60 Tank**
  - **120 MM M1A1 Abrams tank**
- How much DU is in DU rounds?
  - **25 MM = 5.2 ounces per round**
  - **105 MM = 8 pounds per round**
  - **120 MM = 8.6 pounds per round**

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Handling Hazards

- 20 MM / 25MM
  - **NO POTENTIAL FOR CONTAMINATION DURING HANDLING INTACT ROUNDS**
  - **The DU is not visible nor is it exposed in an intact DU round**
  - **20 MM DU fully encased in plastic sabot**
  - **25 MM DU encased in aluminum sabot**
  - **All ship classes surveyed in 1980's to ensure no exposure rate problems from DU storage**

Handling Hazards

- 105 MM / 120 MM
  - **NO POTENTIAL FOR CONTAMINATION DURING HANDLING INTACT ROUNDS**
  - **The DU is not visible nor is it exposed in an intact DU round**
  - **DU is a rod internal to the projectile casing**
  - **Storage areas are surveyed and magazines posted to ensure appropriate distance is maintained from storage areas**

Control of DU

- Controlled by the U.S. Nuclear Regulatory Commission (USNRC) as “source material”
- Title 10 CFR 40
  - 10 CFR 40.13(c)(5) – authorizes DU counterweights
  - 10 CFR 40.22 – authorizes 15 pounds of DU at one time and no more than 150 pounds in one year
  - Any other use of DU requires a license

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How does DU enter the body?

- DU can be inhaled, swallowed or even enter the body through cuts or abrasions, or through embedded metal fragments
- DU can be inhaled during and immediately after DU munitions have impacted a vehicle or the DU munitions are involved in a fire on the battlefield or when DU particles are resuspended into the atmosphere by wind and other disturbances
- Avoid handling spent (fired) DU munitions or fragments of munitions
- Exercise proper field and personal hygiene techniques to prevent DU intake into the body

What are potential health effects?

Numerous studies over 50 years of individuals, including from Operation Desert Shield, who inhaled particles of uranium and recent medical monitoring of persons having DU fragments embedded in their wounds have shown no adverse effects from their uranium or DU exposure.

What are potential health effects?

- At levels likely to be found in the field, exposure to DU, although slightly radioactive, has little potential to affect your health
- DU emits primarily alpha particulate radiation, which is not an external radiation hazard, where a sheet of paper is sufficient to shield them. Therefore the paint, plastic, metal or other covering that typically covers the bare DU reduces radiation exposure and health hazards
- Studies have shown that little uranium ever reaches the kidney even if DU is inhaled, ingested, or absorbed through skin; small amounts of uranium are present in the air and food
- DU aerosols are inhaled or exhaled depending on the size of the DU particles; only the smallest particles reach deep into the lungs, while the large particles are coughed out of the lungs and exhaled or excreted

What can you do to protect yourself?

- First, don’t panic.
- When in the field or suspected contaminated environments, always practice good personal and field hygiene, including washing your hands and face as often as possible
- Avoid handling bare DU fragments, and limit your time in suspect areas
- As with all battlefield debris, do not touch or move the object. This protects you not only from DU, but also from unexploded ordnance.
- Use the protective measures required for handling all munitions; no additional measures are necessary for unfired DU munitions
- Notify your chain of command of the location of any debris

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Medical Surveillance

- Candidates (considered for DU screening) are identified based on verifiable (or suspected) in-theater DU events and post-deployment medical surveillance / screening results
- BUMED provides Medical Treatment Facilities (MTFs) and field medical units guidance using DVA procedures on collection and shipment of urine samples for DU analysis to the Baltimore Department of Veterans Affairs (Baltimore DVA) office.
- The DVA performs the uranium analysis from collected urine samples and reports results to the requesting provider and to the patient.

Medical Surveillance (cont'd)

- To inquire about medical monitoring for potential DU exposures, contact the Navy medical treatment facility or field medical unit that serve your activity or unit
- BUMED POC: Radiation Health Branch, Navy Bureau of Medicine & Surgery (BUMED), Washington, DC 20372-5300, (202) 762-3447, DSN 762-3447
- Department of Veterans Affairs (DVA) POC: Baltimore VA Medical Center, "Urine Uranium Analysis" section, Dr. Melissa McDiarmid, (410) 605-7373

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Take Home Messages

- Depleted Uranium (DU) has many useful civil and military purposes (e.g., shielding counterweights, and munitions)
- Handling intact DU munitions is safe, the DU portion is fully encased
- The heavy-metal toxicity hazard of DU outweighs the radiation hazard
- Thumb Rule: to exceed occupational radiation exposure limits, bare DU would need to be held closely to the body for about 250 hours
- Practice good hygiene before and after potential exposure to DU contamination and avoid handling spent DU munitions with bare hands
- Most noteworthy DU exposures to date involve persons with embedded DU fragments. DVA and medical staff are tracking the health and welfare of these patients who are not showing adverse effects from the embedded DU
- If you have concerns of a potential DU exposure, contact the military medical facility that serves your command, the DVA or contact the USMC RADCON Office (DSN 567-5511/14, (229) 639-5511/14)